

Gulf Cooperation Council

EDICT OF GOVERNMENT

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GSO 212 (1994) (English): INDUSTRIAL SAFETY AND
HEALTH REGULATIONS - PERSONAL PROTECTIVE EQUIPMENT



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GSO 212/1994

**اشتراطات السلامة والصحة الصناعية –
معدات الوقاية الشخصية
INDUSTRIAL SAFETY
AND HEALTH REGULATIONS -
PERSONAL PROTECTIVE EQUIPMENT**

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INDUSTRIAL SAFETY AND HEALTH REGULATIONS - PERSONAL PROTECTIVE EQUIPMENT

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**INDUSTRIAL SAFETY
AND HEALTH REGULATIONS -
PERSONAL PROTECTIVE EQUIPMENT**

1. SCOPE AND FIELD OF APPLICATION

This standard is concerned with “Industrial Safety and Health Regulations - Personal Protective Equipment”.

2. COMPLEMENTARY REFERENCES

- 2.1 GSO 518/1994 “Safety Footwear”.
- 2.2 GSO 519/1994 “Methods of Testing Safety Footwear”.

3. DEFINITIONS

- 3.1 Safety footwear: a shoe which provides protection to the parts of feet, reduces the hazards arising during carrying out work, and containing an integral steel toe cap.
- 3.2 Boot: shoe having a minimum leg height of 90 mm measured vertically from the insole at the back.
- 3.3 Inner sole: a layer of material covering the upper layer of the sole. It serves as a reinforcement to keep the outsole and upper intact for structural stability.

4. REGULATIONS**4.1 General**

- 4.1.1 Protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respirators, protective shields or barriers, shall be provided, used, and maintained in a hygienic and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.
- 4.1.2 Where employees provide their own protective equipment, the employer shall be responsible to assure its adequacy, including proper maintenance, and hygiene of such equipment.
- 4.1.3 All personal protective equipment shall be of safe design and construction for the work to be performed and conforming to approved Gulf standards.
- 4.1.4 Electric welding, gas welding, thermal cutting, brazing, pressure and fusion welding, and operations where protection from radiant energy with moderate reduction of visible light is necessary shall require goggles, face masks, shields, or

helmets, suitable for the type of work, providing protection from all angles of direct exposure and lenses of appropriate shade.

- 4.1.5 Electric arc welding and cutting and hydrogen welding and similar operations, where protection from injurious radiant energy with a large reduction in visible radiant energy is necessary, shall require helmets or shields of insulating material not readily flammable, and designed to protect the head from direct rays and fitted with secure glasses of appropriate shade.
- 4.1.6 Sledging; hammering on metal, stone, and concrete; chipping; calking; use of manual or power tools; and other operations subjecting the eyes or head to flying particles, shall require goggles having safety lenses and screens for side protection, or face masks, shields, and helmets giving equal protection.
- 4.1.7 Scaling, grinding, cutting, or dressing of metals, stone masonry materials, and other operations which produce dust and small particles shall require goggles having safety lenses and screens for side protection, or face masks, shields, and helmets giving equal protection.
- 4.1.8 Babbiting, soldering, pouring of lead joints, casting of hot metals, handling of hot tar, oils, liquids and molten substances, shall require eye protection such as goggles having safety-type lenses and screens for side protection, or face masks, shields and helmets giving equal protection.
- 4.1.9 Handling of acids, caustics, hot liquids, creosoted materials, and operations where protection from gases, fumes, and liquids is necessary shall require goggles with cups of soft pliable rubber or suitable face masks or hoods which cover the head and neck, fitted with lenses of plastic or glass; and other protective clothing which is appropriate to the hazards involved.

4.2 **Eye and Face Protection**

- 4.2.1 Protective eye and face equipment shall be required where there is a probability of injury that can be prevented by such equipment. In such cases, employers shall make conveniently available a type of protector suitable for the work to be performed, and employees shall use such protectors. No unprotected person shall knowingly be subjected to a hazardous environmental condition. Suitable eye protectors shall be provided where machines or operations present the hazard of flying objects, glare, liquids, injurious radiation, or a combination of these hazards.
- 4.2.2 Protectors shall meet the following minimum requirements:
 - 4.2.2.1 They shall provide adequate protection against the particular hazards for which they are designed.
 - 4.2.2.2 They shall be reasonably comfortable when worn under the designed conditions.
 - 4.2.2.3 They shall fit snugly and shall not unduly interfere with the movements of the wearer.
 - 4.2.2.4 They shall be durable.
 - 4.2.2.5 They shall be capable of being disinfected.
 - 4.2.2.6 They shall be easily cleanable.

- 4.2.2.7 Protectors shall be kept clean and in good repair.
- 4.2.3 Persons whose vision requires the use of corrective lenses in spectacles, and who are required by this standard to wear eye protection, shall wear goggles or spectacles of one of the following types:
- 4.2.3.1 Spectacles whose protective lenses provide optical correction.
- 4.2.3.2 Goggles that can be worn over corrective spectacles without disturbing the adjustment of the spectacles.
- 4.2.3.3 Goggles that incorporate corrective lenses mounted behind the protective lenses.
- 4.2.4 When limitations or precautions are indicated by the manufacturer, they shall be transmitted to the user and care taken to see that such limitations and precautions are strictly observed.
- 4.2.5 Design, construction, testing and materials of devices for eye and face protection shall be in accordance with relevant Gulf standards approved by GSMO.
- 4.2.5.1 Lenses to protect the eyes from radiation (excluding laser light) shall be colored or shaded to reduce the light transmittance according to Table (1).
- 4.2.5.2 Lens shades for some specific uses are as follows:

	Shade Number
Carbon Arc Welding	14
Shield Metal - Arc Welding	
8 to 10 mm rod	14
4 to 6 mm rod	12
less than 4 mm rod	10
Gas Shielded - Arc Welding (ferrous)"	
less than 4 mm	11
Atomic Hydrogen Welding	10 - 14
Gas Welding - over 12 mm thickness	6 - 8
under 12 mm thickness	5 - 6
Heavy Cutting - Over 1 50 mm	5 - 6
Medium Cutting - 25 to 150 mm	4 - 5
Light Cutting - under 25 mm	3 - 4
Torch Brazing	3 - 4
Soldering	2

All shaded lenses shall carry the shade number in an area that does not interfere with vision.

Table 1
Transmittances and Tolerances in Transmittance of Various Shades of
Absorptive Lenses, Filter Lenses, and Plates

Shade	Optical Density	Luminous Transmittance				Maximum Infrared Transmittance	Maximum Spectral Transmittance in the Ultraviolet and Violet					
		Maximum	Standard	Minimum	Percent		313 micron	334 micron	365 micron	405 micron		
Number	Maximum	Standard	Minimum	Maximum	Standard	Minimum	Percent	Percent	Percent	Percent	Percent	Percent
1.5	0.26	0.124	0.17	67	61.5	55	25	0.2	0.8	25	65	
1.7	0.36	0.300	0.26	55	50.1	43	20	0.2	0.7	20	50	
2.0	0.54	0.429	0.36	43	37.3	29	15	0.2	0.5	14	35	
2.5	0.75	0.643	0.54	29	22.8	18.0	12	0.2	0.3	5	15	
3.0	1.07	0.857	0.75	18.0	12.9	8.50	9.0	0.2	0.2	0.5	6	
4.0	1.50	1.286	1.07	8.50	5.18	3.16	5.0	0.2	0.2	0.5	1.0	
5.0	1.93	1.714	1.50 _z	3.16	1.93	1.18	2.5	0.2	0.2	0.2	0.5	
6.0	2.36	2.143	1.93	1.18	0.72	0.44	1.5	0.1	0.1	0.1	0.5	
7.0	2.79	2.571	2.36	0.44	0.27	0.164	1.3	0.1	0.1	0.1	0.5	
8.0	3.21	3.00	2.79	0.164	0.100	0.061	1.0	0.1	0.1	0.1	0.5	
9.0	3.64	3.429	2.21	0.061	0.037	0.023	0.8	0.1	0.1	0.1	0.5	
10.0	4.07	3.857	3.64	0.023	0.0139	0.0085	0.6	0.1	0.1	0.1	0.5	
11.0	4.50	4.286	4.07	0.0085	0.0052	0.0032	0.5	0.05	0.05	0.05	1.0	
12.0	4.93	4.714	4.50	0.0032	0.0019	0.0012	0.5	0.05	0.05	0.05	1.0	
13.0	5.36	5.143	4.93	0.0012	0.00072	0.00044	0.4	0.05	0.05	0.05	1.0	
14.0	5.79	5.571	5.36	0.00044	0.00027	0.00016	3.0	0.05	0.05	0.05	1.0	

- 4.2.5.3 Laser Protection. Employees whose occupation or assignment requires exposure to laser beams shall be furnished with suitable laser safety goggles which will protect them from the specific wavelength of the laser and be of optical density (O.D.) adequate for the energy involved. Table (2) lists the maximum power or energy density for which adequate protection is afforded by glasses of optical densities from 5 through 8.

Table 2
Selecting Laser Safety Glass

Intensity Continuous wave Maximum Power Density (watts/sq em)	Attenuation	
	Optical Density (O.D)	Attenuation Factor
10 ⁻²	5	10 ⁴
10 ⁻¹	6	10 ⁶
1 -0	7	10 ⁷
10.0	8	10 ⁸

Output levels falling between lines in this Table shall require the higher optical density.

All protective goggles shall bear labels identifying the following data:

The laser wavelengths for which use is intended.

The optical density of those wavelengths.

The visible light transmission.

- 4.2.5.4 All lenses, shaded or clear, shall withstand the following impact resistance test:

The lens shall be removed from the frame and mounted on a metal anvil. A neoprene gasket of (40 ± 5) durometer, 3 mm thick, 5 mm wide and matching the outside contour of the lens shall be used between the lens and the anvil. The thickness of the gasket shall be trimmed to suit the shape of the lens so as to have the lens is fully supported on the entire periphery by the gasket.

A steel ball 25 to 25.5 mm in diameter weighing approximately 1 gram, shall be dropped onto the mounted lens from the height of (1.270 ± 0.001) m. The ball shall strike the geometric center of the lens within 5 mm.

The lens shall not be damaged by the impact of the ball. Damage includes chips or cracks as well as a fracture.

- 4.2.5.5 Lenses shall not be made from highly flammable materials such as cellulose nitrate.
- 4.2.5.6 The shape of the eye and face protector shall be suitable for the hazard involved.

4.3 Respiratory protection

4.3.1 Permissible practice

- 4.3.1.1 In the control of occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary

objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation and substitution of less toxic materials). When effective engineering controls are not feasible or while they are being instituted, appropriate respirators shall be used pursuant to the following requirements:

- 4.3.1.2 Respirators shall be provided by the employer when such equipment is necessary to protect health of the employee. The employer shall be responsible for the establishment and maintenance of a respiratory protective program which shall include the requirements outlined in (4.3.2).
- 4.3.1.3 The employee shall use the provided respiratory protection in accordance with instructions and training received from the employer.
- 4.3.2 Requirements for a Minimal Acceptable Program
 - 4.3.2.1 Written standard operating procedures governing the selection and use of respirators shall be established.
 - 4.3.2.2 Respirators shall be selected on the basis of hazards to which the worker is exposed.
 - 4.3.2.3 The user shall be instructed and trained in the proper use of respirators and their limitations.
 - 4.3.2.4 Where practicable, the respirators should be assigned to individual workers for their exclusive use.
 - 4.3.2.5 Respirators shall be regularly cleaned and disinfected. Those issued for the exclusive use of one worker should be cleaned after each day's use, or more often if necessary. Those used by more than one worker shall be thoroughly cleaned and disinfected after each use.
 - 4.3.2.6 Respirators shall be stored in a convenient, clean, and sanitary location.
 - 4.3.2.7 Respirators used routinely shall be inspected during cleaning. Worn or deteriorated parts shall be replaced. Respirators for emergency use such as self-contained devices shall be thoroughly inspected at least once a month and after each use.
 - 4.3.2.8 Surveillance of work area conditions and degree of employee exposure or stress shall be maintained on a specific schedule.
 - 4.3.2.9 There shall be regular inspection and evaluation to determine the continued effectiveness of the program.
 - 4.3.2.10 Persons shall not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work while using the equipment. The local physician shall determine what health and physical conditions are pertinent. The respirator user's medical status should be reviewed annually.
- 4.3.3 Air Quality
 - 4.3.3.1 Compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration shall be of high purity. Oxygen contaminants shall not exceed the

requirements of 99 percent oxygen (O₂) by volume, for medical or breathing oxygen: 0.03 percent carbon dioxide (CO₂), 0.001 percent carbon monoxide (CO) and .0005 percent nitric oxide (NO) + nitrogen dioxide (NO₂). Breathing air shall meet at least the requirements of 20-23 percent oxygen by volume, and not exceed 50 ppm of carbon monoxide, 5000 ppm of carbon dioxide and 5 mg/cu m of condensed hydrocarbons. Compressed oxygen shall not be used in supplied air respirators or in open circuit self-contained breathing apparatus that have previously used compressed air. Oxygen must never be used with air line respirators.

- 4.3.3.2 Breathing air may be supplied to respirators from cylinder or air compressors as defined below.
- 4.3.3.3 The compressor for supplying air shall be equipped with necessary safety and standby devices. A breathing air-type compressor shall be used. Compressors shall be constructed and situated so as to avoid entry of contaminated air into the system, and suitable in-line air purifying sorbent beds and filters installed to further assure breathing air quality. A receiver of sufficient capacity to enable the respirator wearer to escape from a contaminated atmosphere in the event of compressor failure, and alarms to indicate compressor failure and overheating shall be installed in the system. If an oil-lubricated compressor is used, it shall have a high-temperature or carbon monoxide alarm, or both. If only a high-temperature alarm is used, the air from the compressor shall be frequently tested for carbon monoxide to insure that it meets the specifications in item 4.3.3. 1.
- 4.3.3.4 Air line couplings shall be incompatible with outlets for other gas systems to prevent inadvertent servicing of air line respirators with nonrespirable gases or oxygen.
- 4.3.3.5 Breathing gas containers shall be marked with name of material in cylinder and its international chemical formula.
- 4.3.4 Use of Respirators
 - 4.3.4.1 Standard procedures shall be developed for respirators use. These should include all information and guidance necessary for their proper selection, use, and care. Possible emergency and routine uses of respirators should be anticipated and planned for.
 - 4.3.4.2 The correct respirator shall be specified for each job. The respirator type is usually specified in the work procedures by a qualified individual supervising the respiratory protective program. The individual issuing them shall be adequately instructed to insure that the correct respirator is issued. Each respirator permanently assigned to an individual should be durably marked to indicate to whom it was assigned. This mark shall not affect the respirator performance in any way. The date of issue shall be recorded.
 - 4.3.4.3 Written procedures shall be prepared covering safe use of respirators in dangerous atmospheres that might be encountered in normal operations or in emergencies. Personnel shall be familiar with these procedures and the available respirators.
 - 4.3.4.3.1 In areas where the wearer, with failure of the respirator, could be overcome by a toxic or oxygen-deficient atmosphere, at least one additional man shall be present.

Communications (visual, voice, or signal line) shall be maintained between both or all individuals present. Planning shall be such that one individual will be unaffected by any likely incident and have the proper rescue equipment to be able to assist the other(s) in case of emergency.

- 4.3.4.3.2 When self-contained breathing apparatus or hose masks with blowers are used in atmospheres immediately dangerous to life or health, standby men must be present with suitable rescue equipment.
- 4.3.4.3.3 Persons using air line respirators in atmospheres immediately hazardous to life or health shall be equipped with safety harnesses and safety lines for lifting or removing persons from hazardous atmospheres or other, and equivalent provisions shall be used for the rescue of persons from hazardous atmospheres. A standby man or men with suitable self-contained breathing apparatus shall be at the nearest fresh air base for emergency rescue.
- 4.3.4.4 Respiratory protection is no better than the respirator in use, even though it is worn conscientiously. Frequent random inspections shall be conducted by a qualified individual to assure that respirators are properly selected, used, cleaned, and maintained.
- 4.3.4.5 For safe use of any respirator, it is essential that the user be properly instructed in its selection, use, and maintenance. Both supervisors and workers shall be so instructed by competent persons. Training shall provide the men an opportunity to handle the respirator, have it fitted properly, test its face-piece-to-face seal, wear it in normal air for a long familiarity period, and, finally, to wear it in a test atmosphere.
- 4.3.4.5.1 Every respirator wearer shall receive fitting instructions including demonstrations and practice in how the respirator should be worn, how to adjust it, and how to determine if it fits properly. Respirators shall not be worn when conditions prevent a good face seal. Such conditions may be a growth of beard, sideburns, a skull cap that projects under the facepiece, or temple pieces on glasses. Also, the absence of one or both dentures can seriously affect the fit of a face piece. The workers diligence in observing these factors shall be evaluated by periodic check. To assure proper protection, the face piece fit shall be checked by the wearer each time he puts on the respirator. This may be done by following the manufacturer's face piece fitting instructions.
- 4.3.4.5.2 Providing respiratory protection for individuals wearing corrective glasses is a serious problem. A proper seal cannot be established if the temple bars of eye glasses extend through the sealing edge of the full face piece. As a temporary measure, glasses with short temple bars or without temple bars may be taped to the wearer's head. Wearing of contact lenses in contaminated atmospheres with a respirator shall not be allowed. Systems have been developed for mounting corrective lenses inside full face piece. When a workman must wear corrective lenses as part of the face piece, the face piece and lenses shall be fitted by qualified individuals to provide good vision, comfort and a gas-tight seal.
- 4.3.4.5.3 If corrective spectacles or goggles are required, they shall be worn so as not to affect the fit of the face piece. Proper selection of equipment will minimize or avoid this problem.

- 4.3.4.6 Respirators using an external source of air
 - 4.3.4.6.1 The source of air shall meet the requirements mentioned in (4.3.3).
 - 4.3.4.6.2 The respirator unit with the air supply shall be approved for a specific service as a unit by GSMO.
- 4.3.5 Maintenance and Care of Respirators
 - 4.3.5.1 A program for maintenance and care of respirators shall be adjusted to the type of plant, working conditions, and hazards involved, and shall include the following basic services:
 - 4.3.5.1.1 Inspection for defects (including a leak check);
 - 4.3.5.1.2 Cleaning and disinfecting;
 - 4.3.5.1.3 Repair;
 - 4.3.5.1.4 Storage. Equipment shall be properly maintained to retain its original effectiveness.
 - 4.3.5.2 Respirators Inspection
 - 4.3.5.2.1 All respirators shall be inspected routinely before and after each use. A respirator that is not routinely used but is kept ready for emergency use shall be inspected after each use and at least monthly to assure that it is in satisfactory working condition.
 - 4.3.5.2.2 Self-contained breathing apparatus shall be inspected monthly. Air and oxygen cylinders shall be fully charged according to the manufacturer's instructions. It shall be determined that the regulator and warning devices function properly.
 - 4.3.5.2.3 Respirator inspection shall include a check of the tightness of connections and the condition of the face piece, headbands, valves, connecting tube, and canisters. Rubber or elastomer parts shall be inspected for pliability and signs of deterioration. Stretching and manipulating rubber or elastomer parts with a massaging action will keep them pliable and flexible and prevent them from taking a set during storage.
 - 4.3.5.2.4 A record shall be kept of inspection dates and findings for respirators maintained for emergency use.
 - 4.3.5.3 Routinely used respirators shall be collected, cleaned, and disinfected as frequently as necessary to insure that proper protection is provided for the wearer. Each worker shall be briefed on the cleaning procedure and be assured that he will always receive a clean and disinfected respirator. Such assurances are of greatest significance when respirators are not individually assigned to workers. Respirators maintained for emergency use shall be cleaned and desinfected after each use.
 - 4.3.5.4 Replacement or repairs shall be done only by experienced persons with parts designed for the respirator. No attempt shall be made to replace components or to make adjustments or repairs beyond the manufacturer's recommendations. Reducing or admission valves or regulators shall be returned to the manufacturer or to a trained technician for adjustment or repair.

4.3.5.5 Respirator Storage

- 4.3.5.5.1 After inspection, cleaning, and necessary repair, respirators shall be stored to protect them against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators placed at stations and work areas for emergency use should be quickly accessible at all times and should be stored in compartments built for the purpose. These compartments shall be clearly marked. Routinely used respirators, such as dust respirators, may be placed in plastic bags. Respirators should not be stored in such places as lockers or tool boxes unless they are in carrying cases or cartons.
- 4.3.5.5.2 Respirators shall be packed or stored so that the face piece and exhalation valve will rest in a normal position and function will not be impaired by the elastomer setting in an abnormal position.
- 4.3.5.5.3 Instructions for proper storage of emergency respirators, such as gas masks and self-contained breathing apparatus, are found in "use and care" instructions mounted inside the carrying case lid.

4.3.6 Identification of Gas Mask Canisters

- 4.3.6.1 The primary means of identifying a gas mask canister shall be by means of properly worded labels. The secondary means of identifying a gas mask canister shall be by a color code.
- 4.3.6.2 All who issue or use gas mask shall see that all gas mask containers purchased or used by them are properly labeled and colored in accordance with these requirements before they are placed in service and that the labels and colors are properly maintained at all times thereafter until the canisters have completely served their purpose.
- 4.3.6.3 On each canister the following shall appear in bold letters:
- 4.3.6.3.1 Canister for _____
(Name for Atmospheric Contaminant)
- 4.3.6.3.2 In addition, essentially the following wording shall appear beneath the appropriate phase on the canister label: «For respiratory protection in atmospheres containing more than _____ percent by volume of _____
_____».
- 4.3.6.4 Canisters having a special high-efficiency filter for protection against radionuclides and other highly toxic particulate shall be labeled with a statement of the type and degree of protection afforded by the filter. The label shall be affixed to the neck end of the canister. The degree of protection shall be marked as the percent of penetration of the canister by a 0.3 micron diameter dioctyl phthalate (DOP) smoke at a flow rate of 85 liters/min.
- 4.3.6.5 Each canister shall have a label warning that gas masks should be used only in atmospheres containing sufficient oxygen to support life (at least 16 percent by volume), since gas mask canisters are only designed to neutralize or remove contaminants from the air.

- 4.3.6.6 Each gas mask canister shall be painted with a distinctive colour or combination of colours indicated in Table (3). All colours used shall offer a high degree of resistance to chipping, scaling, peeling, blistering, fading, and the effects of the ordinary atmospheres to which they may be exposed under normal conditions of storage and use. Appropriately a coloured pressure sensitive tape may be used for the strips.

Table (3)

Atmospheric contaminants to be protected against	Colors assigned*
Acid gases	White
Hydrocyanic acid gas	White with 15 mm green stripe completely around the canister near the bottom
Chlorine gas	White with 15 mm yellow stripe completely around the canister near the bottom
Organic vapors	Black
Ammonia gas	Green
Acid gases and ammonia gas	Green with 15 mm white stripe completely around the canister near the bottom
Carbon monoxide	Blue
Hydrocyanic acid gas and chloropicrin vapor	Yellow with 15 mm blue stripe completely around the canister near the bottom
Acid gases and organic vapors	Yellow
Acid gases, organic vapors, and ammonia gases	Brown
Radioactive materials, excepting tritium and noble gases	Purple (Magenta)
Particulates (dusts, fumes, mists, fogs, or smokes) in combination with any of the above gasses or vapors	Canister color for contaminant, as designated above with 15 mm gray stripe completely around the canister near the top
All of the above atmospheric contaminants	Read with 15 mm gray stripe completely around the canister near the top

* Gray shall not be assigned as the main color for a canister designed to remove acids or vapors.

Note: Orange shall be used as a complete body, or stripe color to represent gases not included in this Table. The user will need to refer to the canister label to determine the degree of protection the canister will afford.

4.4 Head Protection

- 4.4.1 Employees working in areas where there is a possible danger of head injury from impact, or from falling or flying objects, or from electrical shock and burns, shall be protected by protective helmets.
- 4.4.2 Helmets for the protection of heads of occupational workers shall meet the following requirements:
- 4.4.3 Helmets complete with suspension and headband shall weigh not more than 425 g.
- 4.4.4 All helmets shall be capable of withstanding the impact of a 3.6 kg steel ball dropped 1.5 m upon its crown at minus 18°C and plus 48°C.
- 4.4.5 All helmets shall be capable of meeting the following electrical test:
 - 4.4.5.1 Immerse the helmet in tap water with the top down so the water covers both the inside and the outside, and so the brim protrudes 2 cm above the water surface. The brim should remain dry.
 - 4.4.5.2 Place electrodes in the water, one inside and one outside the helmet.
 - 4.4.5.3 Connect the electrodes to a source of 2,200 volts (rms), 60 hertz alternating current.
 - 4.4.5.4 The current flow through the helmets shall not exceed 3 milliamperes

4.5 Foot Protection

- 4.5.1 Foot protection shall be used by personnel handling heavy materials. The protection is for compact and impact forces. The toe protection shall be an integral part of the footwear and must be able to withstand a compression load of 2268 kg on a bearing surface of not less than 76 mm diameter.
- 4.5.2 Toes of safety shoes must be able to withstand an impact test of a 22 kg load dropped (vertically guided) on a 5 cm steel ball or rod (2.5 cm radius on end) placed on the toe. The height of load, above the ball or rod, dropped is based on the class of footwear to withstand the following impact load:
 - Class 75 - 10 kg m (10 divided by 22 = 0.45m)
 - Class 50 - 7 kg m (7 divided by 22 = 0.32 m)
 - Class 30 - 4 kg m (4 divided by 22 = 0.18 m)
- 4.5.3 Safety shoes of gaiter type ankle high with elastic gussets in the sides shall be used in plants where employees are exposed to splashes of molten metal. The tops of the shoes shall be covered by the trouser leg, spats or leggings, to keep out molten metal.
- 4.5.3.1 In construction or other industries where there may exist protruding nails, shoes or boots shall be equipped with reinforced soles or inner soles of flexible metal.

- 4.5.3.2 The safety shoes used shall comply with the Gulf standards mentioned in (2.1) and (2.2).

4.6 **Clothing**

- 4.6.1 For Heat and Hot Metal: For protection against heat and splashes of hot metal leather clothing shall be worn. The garments shall be of good quality, solidly constructed with no gaping during body movement. Fasteners shall permit easy and rapid removal. There shall be no cuffs or other projections to catch or hold hot metal. For higher heat work like radiant heat or flame hazards, asbestos and wool garments will be used. For extremely high temperatures such as furnace and oven repair, coking and slagging aluminized fabric clothing shall be used.

4.6.2 **Gloves**

- 4.6.2.1 Materials used shall include rubber, neoprene, vinyl, polypropylene, and polyethylene films and fabrics coated with them. Manufacturer's recommendations for use against hazards shall be followed. Gloves shall be long enough to cover the wrists leaving no gap between the gloves and the sleeve.

- 4.6.2.2 Employees handling rough, sharp-edged, abrasive materials or where the work subjects the hand to lacerations, punctures, burns, or bruises, shall use hand protection.

- 4.7 Electrical Protective Devices: Rubber protective equipment for electrical workers shall be visually inspected prior to use and shall conform to the following requirements:

- 4.7.1 Insulating gloves shall be seamless with a smooth finish, made from high grade cis-1,4 polyisoprene compound of natural rubber or synthetic origin properly vulcanized.

- 4.7.1.1 Rubber insulating gloves are rated in five classes. Minimum thickness of gloves shall be as follows:

Class	In Crotch	Other Than Crotch
0	0.46 mm	0.54 mm
1	0.76 mm	0.89 mm
2	0.97 mm	1.14 mm
3	1.27 mm	1.52 mm
4	1.52 mm	1.91 mm

- 4.7.1.2 Filled with water and submerged in water the gloves must be able to withstand the requirements of Tables (4) and (5).

Table (4)
A-C Voltage Requirements

Class of glove	3 min proof test voltage rms volts	Minimum break-down voltage rms voltage	Minimum proof test current mA			
			267 mm glove	356 mm glove	406 mm glove	457 mm glove
Class 0	5000	6000	8			
Class 1	10000	20000		10	12	14
Class 2	15000	25000		12	14	16
Class 3	20000	30000		14	16	18
Class 4	35000	45000				20

Table (5)
D-C Voltage Requirements

Class of glove	3 min proof test voltage Avg. volts	Minimum break-down voltage Avg. voltage
Class 0	20000	35000
Class 1	45000	60000
Class 2	55000	70000
Class 3	65000	80000
Class 4	80000	100000

- 4.7.1.3 An air test shall be performed on gloves prior to use.
- 4.7.2 Matting shall consist of a rubber compound corrugated on one surface and backed with cotton fabric, or having one or more cotton fabric inserts. Thickness shall not be less than 6.4 mm measured over the corrugations. The tensile strength shall not be less than 50 kg/sq cm.
- 4.7.2.1 Matting shall pass a voltage test of 15,000 volts applied for 1 min. and not show any sign of weakness.
- 4.7.3 Insulating blankets shall be seamless, made of a high grade cis-1, 4 polyisoprene rubber compound of natural or synthetic compound properly vulcanized. The blankets may also be made of elastomer or a combination of elastomers.
- 4.7.3.1 The thickness of the blanket shall not be less than 3 mm.

- 4.7.3.2 Blankets shall be free from punctures, blisters, protuberances, imbedded foreign matter or other physical defects that can be detected by surface inspection.
- 4.7.3.3 Blankets shall withstand a proof test as required in Table (6) with voltage applied continuously for 3 min.

Table (6)
Electrical Proof Tests

AC		DC	
Proof test voltage rms V.	Flashover clearance mm	Proof test voltage rms V	Flashover clearance mm
20000	50	55000	130

- 4.7.4 Insulating hoods shall be made of a high grade vulcanized rubber compound, the hydrocarbon content of which shall consist of either natural or synthetic rubber or a blend of both.
- 4.7.4.1 The minimum thickness shall not be less than 8 mm.
- 4.7.4.2 Hoods shall be free from blisters, holes, cuts, cracks, thin spots, embedded foreign material, or other physical defects that can be detected by visual inspection.
- 4.7.4.3 Hoods must be able to withstand an alternating potential of 20,000 volts (rms value) applied for 3 min.
- 4.7.5 Insulating line hose shall be made of a high grade vulcanized rubber compound.
- 4.7.5.1 The wall thickness shall not be less than 6 mm.
- 4.7.5.7 Hose shall be free from blisters, holes, cuts, cracks, thin spots. embedded foreign matter or other physical defects.
- 4.7.5.3 Each hose must be able to withstand an alternating potential of 20,000 volts (rms value) applied for 3 min.
- 4.7.6 Insulating sleeves shall be seamless and made from high grade cis- 1,4 polyisoprene rubber of natural or synthetic compound properly vulcanized.
- 4.7.6.1 The minimum thickness of the sleeves shall be as follows:
- Class 1 - 0.89 mm
- Class 2 - 1.14 mm
- Class 3 - 1.52 mm
- Class 4 - 1.91 mm
- 4.7.6.2 The minimum tensile strength shall not be less than 175 kg/sq cm.
- 4.7.6.3 The sleeves shall be able to withstand a proof test for the appropriate class designation specified in Tables (7) and (8). The voltage is to be continuous for 3 min.

Table (7)
A-C Voltage Requirements

Class of sleeve	3 min proof test voltage (rms)	Minimum break-down voltage (rms)	Minimum proof test current mA		
			Regular	Large	Extra large
1	10000	20000	18	20	22
2	15000	25000	20	22	24
3	20000	30000	24	26	28
4	35000	45000	26	28	30

Table (8)
D-C Voltage Requirement

Class of sleeve	3 min proof test voltage (avg)	Minimum break down voltage (avg)
1	45000	60000
2	55000	70000
3	65000	80000
4	80000	100000

4.8 Safety Belts, Lifelines, and Lanyards

- 4.8.1 Lifelines, safety belts, and lanyards shall be used only for safeguarding employees. Any lifeline, safety belt, or lanyard actually subjected to in-service loading, as distinguished from static load testing, shall be immediately removed from service and shall not be used again for employee safeguarding.
- 4.8.2 Lifelines shall be secured above the point of operation to an anchorage or structural member capable of supporting a minimum dead weight of 2450 kg.
- 4.8.3 Lifelines used on rock-scaling operations, or in areas where the lifeline may be subjected to cutting abrasion, shall be minimum of 22 mm wire core manila rope. For all other lifeline applications, a minimum of 20 mm manila or equivalent, with a minimum breaking strength of 2450 kg shall be used.
- 4.8.4 Safety belt lanyard shall be a minimum of 13 mm nylon, or equivalent, with a maximum length to provide for a fall of no greater than 2 m. The rope shall have a nominal breaking strength of 2450 kg.
- 4.8.5 All safety belts and lanyard hardware shall be drop forged or pressed steel, cadmium plated. Their surface shall be smooth and free from sharp edges. All safety belts and life lines shall be maintained in safe condition.

- 4.8.6 All safety belts and lanyard hardware, except rivets, shall be capable of withstanding a tensile loading of 1800 kg without cracking, breaking, or taking a permanent deformation.
- 4.8.7 Lineman's Body Belts, Safety Straps, and Lanyards
- 4.8.7.1 This subparagraph shall be complied with all lineman's body belts, safety straps and lanyards.
- 4.8.7.2 Hardware for lineman's body belts, safety straps, and lanyards shall be drop forged or pressed steel and have a corrosion resistant finish. Surfaces shall be smooth and free of sharp edges.
- 4.8.7.3 All buckles shall withstand a 900 kg tensile test with a maximum permanent deformation not greater than 0.4 mm.
- 4.8.7.4 D rings shall withstand a 2270 kg tensile test without failure. Failure of a D ring shall be considered cracking or breaking.
- 4.8.7.5 Snaphooks shall withstand a 2270 kg tensile test without failure. Failure of a snaphook shall be distortion sufficient to release the keeper.
- 4.8.7.6 All fabric used for safety straps shall withstand an A.C. dielectric test of not less than 25,000 volts/foot "Dry" for three min., without visible deterioration.
- All fabric and leather used shall be tested for leakage current which shall not exceed 1 milliamperere when a potential of 3,000 volts is applied to the electrodes positioned 30 cm apart.
- Direct current tests may be permitted in lieu of alternating current tests.
- 4.8.7.7 The cushion part of the body belt shall:
- Contain no exposed rivets on the inside.
 - Be at least 76 mm in width.
 - Be at least 4 mm thick if made of leather.
 - Have pocket tabs that extend at least 38 mm down and 76 mm back of the inside of circle of each D ring for riveting on plier or tool pockets. On shifting D belts, this measurement for pocket tabs shall be taken when the D ring section is centered.
- 4.8.7.8 A maximum of four tool loops shall be so situated on the body belt that 10 cm of the body belt in the center of the back, measuring from D ring to D ring, shall be free from tool loops and any other attachments.
- 4.8.7.9 Suitable copper, steel, or equivalent liners shall be used around the bar of D rings to prevent wear between these members and the leather or fabric enclosing them.
- 4.8.7.10 All stitching shall be of a minimum 19 kg weight nylon or equivalent thread and shall be locked stitching. Stitching parallel to an edge shall not be less than 5 mm from edge of narrowest member caught by the thread. The use of cross stitching on leather is prohibited.
- 4.8.7.11 The keeper of snaphooks shall have a spring tension that will not allow the keeper to begin to open with a weight of 1.0 kg or less, but the keeper of snaphooks shall

begin to open with a weight of 1.8 kg when the weight is supported on the keeper against the end of the nose.

4.8.7.12 Testing of lineman's safety straps, body belts and lanyards shall be in accordance with the following procedure:

- Attach one end of the safety strap or lanyard to a rigid support, the other end shall be attached to a 113 kg canvas bag of sand. Allow the 113 kg canvas bag of sand to free fall 1.2 m for (safety strap test) and 1.8 m for (lanyard test), in each case stopping the fall of the 113 kg bag.
- Failure of the strap or lanyard shall be indicated by any breakage or slippage sufficient to permit the bag to fall free of the strap or lanyard. The entire “body belt assembly” shall be tested using one D ring. A safety strap or lanyard that is capable of passing the “Impact loading test” and attached as required shall be used. The body belt shall be secured to the 113 kg bag of sand at a point to simulate the waist of man and allowed to drop as stated. Failure of the body belt shall be indicated by any breakage or slippage sufficient to permit the bag to fall free of the body belt.

4.9 **Safety Nets**

4.9.1 Safety nets shall be provided when work places are more than 7.6 m above the ground or water surface, or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines, or safety belts is impractical.

4.9.2 Where safety net protection is required by this part, operations shall not be undertaken until the net is installed in place and has been tested.

4.9.3 Nets shall extend 1 m beyond the edge of the work surface where employees are exposed and shall be installed as close under the work surface as practicable but in no case by more than 7.6 m below such work surface. Nets shall be hung with sufficient clearance to prevent user's contact with the surfaces or structures below. Such clearances shall be determined by impact load testing.

It is intended that only one level of nets be required for bridge construction.

4.9.4 The mesh size of nets shall not exceed 150 mm by 150 mm. All new nets shall meet accepted performance standards of 2420 kg m minimum impact resistance as determined and certified by the manufacturer, and shall bear a label or proof test. Edge ropes shall provide a minimum breaking strength of 2270 kg.

4.9.5 Forged steel safety hook or shackles shall be used to fasten the net to its supports.

4.9.6 Connections between net panels shall develop the full strength of the net.

4.10 **Working Over or Near Water**

4.10.1 Employees working over or near water, where the danger of drowning exists, shall be provided with life jacket or buoyant work vests.

4.10.2 Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects which would alter their strength or buoyancy. Defective units shall not be used.

- 4.10.3 Ring life buoys with at least 27 m of line shall be provided and made readily available for emergency rescue operations. Distance between ring life buoys shall not exceed 60m.
- 4.10.4 At least one lifesaving skiff shall be immediately available at locations where employees are working over or adjacent to water.
- 4.11 Safety Showers and Eye Washers
- 4.11.1 Where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing with potable water of the eyes and body shall be provided within the work area for immediate emergency use. Water temperature shall not exceed 50°C.
- 4.11.2 Near each open top tank containing a liquid which may burn, irritate, or otherwise be harmful to the skin if splashed upon the worker's body, there shall be a supply of potable water. The water pipe (carrying a pressure not exceeding 1.76 kg/sq cm) shall be provided with a quick opening valve and at least a 1.2 m hose of not smaller than 20 mm diameter, so that no time may be lost in washing off liquids from the skin or clothing. Alternatively, safety showers and eye washers shall be provided in cases where harmful chemicals may be splashed on parts of the body.
- Operators with sores, burns or other skin lesions requiring medical treatment shall not be allowed to work at their regular operations until so authorized by a physician. Any small skin abrasions, cuts, rash, or open sores which are found or reported shall be treated by a properly designated person so that chances of exposure to the chemicals are removed. Workers exposed to chromic acids shall have a periodic examination of the nostrils and other parts of the body to detect incipient ulceration.
 - Sufficient washing facilities, including soap, individual towels, and hot water, shall be provided for all persons required to use or handle any liquids which may burn, irritate, or otherwise be harmful to the skin.
- 4.11.3 At all safety showers and eye washers a sign shall be posted calling attention to the installation.
- 4.11.4 If the clothing worn by an employee becomes contaminated by a hazardous substance, the employee shall remove the clothing without undue delay, and the clothing shall not be worn again until the hazardous substance has been removed.